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Effects of European VERs on Japanese Autos

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Even for so highly differentiated a product as cars, voluntary export restraints do not protect domestic industries or consumers. Demand is deflected to unrestrained third countries, the restrained exporter upgrades quality, and consumers end up paying more.

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The voluntary export restraints (VERs) that the U.K., France, and Germany negotiated with Japanese automakers show why VERs do not protect domestic industries and probably end up costing consumers more.

First, most EC countries followed suit after the British negotiation with Japan in 1976 (the domino effect).

Second, the VERs did not arrest import penetration by third countries. When Japanese imports were restricted, the French simply bought Italian and German cars.

Third, the Japanese upgraded the quality of cars sold on the French market between 1981 and 1983. (The VER was not strictly binding in France until 1984 and in Germany until 1985.)

Fourth, between 1979 and 1986 French, German, and Japanese producers supplied an increasingly similar product mix on the French car market, whereas the Italians created a distinctly different type of product.

Fifth, in 198[illegible] and 1985 the quota raised auto prices in France about 9%, costing French consumers about 320 million francs and saving only about 300 jobs.

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Table of Contents

1. Introduction

Non-tariff barriers (NTBs), including voluntary export restraints (VERs), are on the rise. For GATT members, they provide a way to circumvent the spirit of the membership without directly confronting the Agreement to which member countries ascribe. Much the same applies to EC members: VERs by individual members allow them to circumvent the CET and Community policies while providing immediate relief to domestic producers. This paper examines how the car markets in France, the UK, and West Germany adjusted to the imposition by their governments of restrictions on imports of Japanese autos.

Theoretical studies (Falvey, 1979; Rodriguez, 1979) suggest that quotas and VERs will lead to quality upgrading within the quantity-constrained categories. These predictions have found empirical support for studies of NTBs in footwear (Aw and Roberts, 1986, 1987) and autos (Feenstra, 1984, 1985). Rents resulting from NTBs will accrue to distributors in the importing countries in the case of an import quota and to producers in the exporting country in the case of a VER. This is the usual outcome because retailing is usually competitive and governments rarely auction off license permits. In addition, unlike a price measure, a quantitative restriction may affect market structure, rendering it less competitive. Finally, for relatively homogeneous commodities,

NTBs are porous (Baldwin, 1982).

For cars, detecting the effects of VERs is complicated by the organizational structure of the European car industry, by currency realignments, and by product differentiation. First, the distribution and sale of cars in the EC markets is highly rigid. 1/ Second,

evidence from U.S. unit value indexes of car (and machinery) imports from Germany strongly suggest the presence of "pricing to market" (PTM). PTM occurs when firms do not pass through exchange rate changes into their export prices. 2/ Given that exchange rates fluctuated among EC members, this creates an identification problem since a higher car price in, say France, during the period when the VER was in effect could reflect the devaluation of the Franc against the yen rather than the effect of the VER. Finally, the car industry is characterized by extreme product differentiation. Product differentiation and recognizable brand names certainly render it impossible to bypass the restraint via transhipment through third countries as in the case of homogeneous products like st[illegible] 3/ In this sense it is easier to analyze the effects of VERs. But product differentiation also requires estimates of the price elasticities of demand by country of origin which are difficult to obtain. 4/

To deal with these complications, we approach the analysis first at the industry, then at the product level. Section 2 surveys the restrictions on automobile trade. Section 3 examines the patterns of trade diversion at the aggregate level. In section 4, analysis of a sample of cars sold on the French and German markets during 1979-85 establishes that the VER was binding in France during 1984 and 1985, but never in Germany. The same panel data is used in section 5 to further analyze the change in product mix sold on the French market using multilateral index numbers. The indexes show a move towards a similar product mix for French, Japanese, and German cars and a divergent trend for Italy. Conclusions follow in section 6.

2. Restrictions on Automobile Trade

Price and non-price restrictions on automobile trade among major developed country producers and consumers is summarized in Table 1. It is apparent that, with the exception of the Italian-Japanese agreement, up until the mid 70's, trade was only hampered by moderate tariffs ranging from 3% in the U.S. to 10.3% in the EC. Because the bilateral agreement between Japan and Italy is so restrictive (about 2,000 cars exchanged) and has been in place for so long, we will not analyze the implications of that restraint. 5/

A turn occurred in 1976 when the British Carmakers Association (SMMT) and the corresponding Japanese organization (JAMA) agreed to limit the market share of Japanese cars (in units) in British apparent consumption to 11%. At the time, as shown in Table 2, Japanese penetration in Britain was three times higher than in France and Germany and equal to that in the U.S. This Anglo-Japanese agreement triggered a succession of measures. In 1977, the President of France publicly announced that France would not tolerate a Japanese market share exceeding 3% (in units) of French apparent consumption. This domino effect spread to the U.S. where a petition for import relief on passenger cars was (unsuccessfully) lodged by the UAW in August 1980.

By 1981, these threats on Japanese imports materialized. In France the agreement was implemented in 1980. Following the unsuccessful attempt at introducing a bill imposing a quota, the US chose to negotiate a VER: on May 1, 1981, Japan announced a 3-year system of VERs on the export of passenger cars to the US market. In June 1981, Japan agreed to limit exports (in units) to the Benelux countries to their 1980 level. With Germany, Japan agreed not to raise its share in German apparent consumption by more than 1% per year. Finally, in 1985, Sweden introduced some kind of "surveillance" on car imports from Japan.

Were the VERs binding? Table 2 shows the evolution of Japan's share in apparent consumption for major industrialized countries. Sweden and Switzerland are included as reference countries since quantitative restrictions were either absent (Switzerland) or started later (Sweden). The US is included since it represents approximately half of Japanese car exports. The data show that the 11% quota was filled for Great Britain virtually every year. For France, the figures suggest that the quota was not strictly binding before 1984. For Germany, the quota allowed for approximately a yearly 1% increase in Japan's share in apparent consumption (exact figures in parenthesis in Table 2). The aggregate figures suggest that the quota was not strictly binding over the period. Finally, note the 1977 French "announcement" effect. It would appear that the

threat of forthcoming restrictions led the Japanese to shift supply away from French to German markets during 1978 and 1979.

3. Country Substitution Effects

Because the VER has been source specific, we can analyze the effect of the quantitative restriction on resource allocation by considering only three countries: the home country having negotiated the VER; a partner country (EC or EFTA); the outside country with whom the VER has been negotiated (Japan). For expository purposes assume that the home country is small enough so that the supply price for cars from abroad is perfectly elastic over the relevant range. Competition prevails before and after the introduction of the VER. 6/ For now all cars are perfect substitutes.

Figure 1 shows that under free trade Q_0Q_1 cars are imported, of which Q_0Q_2 are originated in the partner country. The introduction of a VER reducing imports from the outside country to Q_3Q_4 leads to an increase in domestic supply and to increased imports from the partner (trade diversion). The partner increases his surplus by areas (1) + (2). The global resource allocation loss from the VER is area (3). Note that a tariff which would achieve the same increase in domestic supply would only lead to a resource allocation loss equivalent to area (1). Consumers lose area (5). Since the VER is administered by the exporting country, there is a rent transfer equal to area (4).

However, because cars are highly differentiated, one cannot show the trade diversion effects towards the partner in a single diagram. However, maintaining the small country assumption for home country exports, one can show how equilibrium in the domestic car industry will be affected by a VER. Figure 2, quadrant 1 gives the derived demand for domestic cars which will shift in response to a change in the relative price of partners (p^P) and the third country (p^j). Quadrant 3 represents domestic supply as a family of 45^0 lines where P is the weighted price the domestic producer obtains from selling cars in the domestic market (p^d) and abroad (p^e). 7/ For a given supply, shown as a 45^0 line in quadrant 3, the proportion of cars sold domestically will be an increasing function of the relative price obtained in the market (p^d/p^e). Initial equilibrium is at Q_0 where, $S_0^d = D_0^d$.

Suppose that after taking into account the shifts in demand towards partners, the VER ($p_1^j > p_0^j$) shifts out the demand for domestic cars to D_1. 8/ Then at the previous set of prices, there is excess demand, ED_0. This excess demand can be eliminated by the combination of an increase in supply ($P^0 \dashrightarrow P^1$) and a diversion of sales to the domestic market. Another way to eliminate the excess demand is the fall in demand caused by the higher price. Neglecting changes in inventories, if there is some supply response, the new equilibrium will be at Q_1 with a higher domestic market relative price. The

outcome with respect to exports will depend on a number of factors. For example, if export supply is strong, or if subsidies are provided to export sales at the same time as the VER, one might see an increase in the share of export sales following the introduction of the VER.

The effect of introducing product differentiation has an ambiguous effect on welfare. If cars supplied by EC partners have similar characteristics and quality as Japanese cars, then the consumer welfare cost of the VER will be low and the rent transfer will be low. On the other hand, if previously exported cars are now directed to the domestic market, then there will be little supply response. Finally, regardless of differentiation, the relative elasticities of supply in the home and partner country will affect the extent of welfare loss.

Table 3 shows total car registrations, domestic market share, production growth and export shares for France, Germany and the UK. First, it is clear from new registrations that demand started to decline in 1980 in all three countries as a result of the recession. Demand picked up again in 1983 for Germany and the UK while for France due to the expansionary policies of the Socialist government, the two peak years were 1982 and 1983. Second, the domestic market share in apparent consumption was declining in all three countries, particularly in France and the UK around the years of the negotiation of the VER. The VER did not stop the decline in France, nor in the UK. Third, while the UK car industry continued its decline with negative growth and declining export share, export share rose in France in response to fiscal incentives to exporters, in spite of three years of negative production growth. In sum, at the aggregate

level, the VERS did not achieve the results expected by the domestic car industry, i.e. a resumption of growth and an increase in domestic market share.

4. The Impact of Restrictions on Japanese Car Prices

The data in table 2 suggest that the VERs imposed by EC countries on Japan can be split between non-binding and binding countries. For example the VER appears binding in France starting around 1984, but not in Germany. If this is the case, then the price of an equal "quality" Japanese car in France should be higher in years when the quota is binding than in years when it is not. Also, in Germany, changes in the price of Japanese cars should be entirely explained by changes in quality.

To test this hypothesis, we constructed a sample of French, Italian, German and Japanese cars sold in France during 1979-85. This sample consists of all major car models defined in terms of horsepower, maximum speed, engine size, length, width, weight, and fiscal horsepower but not in terms of interior characteristics. However, price and sales data may distinguish across the complete set of characteristics (e.g. distinguish between a Citroen CX-Pallas and a Citroen CX-Prestige). We consistently chose price and sales data for the models with highest sales. Our sample therefore covers approximately 60% of French car sales and 50% of foreign car sales each year. We also collected the price data for the same Japanese car models sold in Germany during the same period.

Using the Lancasterian approach, we assume that quality is defined by a continuum of characteristics, X, and that these characteristics are reflected in prices. 9/ Observed prices will depart from prices predicted by characteristics when there are sharp changes in availability. Following the semi-logarithmic formulation successfully estimated in the literature, this approach suggests the following statistical model:

$$(1) \qquad \ln p^{c}_{m,t} = \alpha_0 + \sum_k \beta_k X^{c}_{k,m,t} + \sum_{t=2}^{7} \gamma_t D_t + v_t$$

where the error terms v_t are assumed to have the usual properties; c is a superscript for the supplying country; m is an index varying over models; k is an index varying over characteristics; and D_t is a dummy taking a value of 1 in year t, and zero otherwise. The dummy variables are expected to capture sharp changes in availability. For example a shortage of Japanese cars in year t would result in a significantly positive coefficient for γ_t.

Table 4 gives the final results from estimating (1) after selecting the most significant common characteristics over the sample. As in previous studies, the characteristics show the expected positive signs when significant, and the model accounts for most of the variation in the models' list prices expressed in constant Francs or

constant Deutschmarks. (Deflation is by the French CPI for cars sold in France and by the German CPI for cars sold in Germany.)

More interestingly, the dummy variables are significant for Japanese cars sold in the French market during 1984 and 1985 when the data on apparent consumption suggested a strictly binding quota. On the other hand, no year dummy variables for Japanese cars sold in the German market are significant, confirming the impression gathered from the data on apparent consumption. Interestingly, note also the significant negative year coefficient for Germany in 1980, 1981 and 1983, and to a lesser extent for Germany in 1982 and Italy in 1981. These years correspond to the period when these two countries raised significantly their sales in France in response to stagnating home demand. This change in pricing is not surprising in view of the retailing structure of the EC automobile market described in the introduction which allegedly makes possible market segmentation.

The robustness of the fixed effects detected in the regressions was checked by heteroscedasticity and sensitivity tests. First we tested for heteroscedasticity across years using the Bartlett test. We accepted the null hypothesis of homoscedasticity at the 1% significance level for all countries. Next, we pooled all observations across years for each country and tested again for heteroscedasticity. This time the Bartlett test detected heteroscedasticity, so we performed the appropriate correction. 10/ The corrected coefficients for the year dummies were well within one standard error of the original estimates. Coefficient and standard error estimates in Table 4 are those after correction for heteroscedasticity.

We also performed two sensitivity tests. The first concerned the stability of the year dummy coefficients vis-a-vis the choice of characteristics. We found that omitting each characteristic one-by-one never changed the year dummy coefficient values by more than one standard error, except for the Japanese hedonic regression on the French market where the coefficients of the dummies for 1984 and 1985 changed by 1.3 standard error when the horsepower variable was deleted. The second test concerned the stability of the characteristics coefficients to the period specifications, since these coefficients are used later on to compute price and quality indexes. We re-estimated (1) for three different subperiods (79-81, 82-83, and 84-85) and found that the F-test for coefficient stability was accepted. 11/

Following Feenstra (1985), we use predicted prices from the estimation of (1), excluding the year dummies, to construct average unit quality values (in current Francs) for Japanese cars sold in France. These values are reported in Table 5 where they are compared with observed unit values from our sample. The difference between the two values thus represents the price effect of the quota. Unit value increase by 31% between 1981 and 1983 and by 15% between 1983 and 1985 and unit quality by 29% between 1981 and 1983 and by 6% between 1983 and 1985. In other words, quality change accounts for almost 100% of the price change between 1981 and 1983 but only for 40% of the price rise between 1983 and 1985. Since Feenstra (1984, 1985) also detected quality upgrading in the much more important US market (see table 2), it may be that the observed quality upgrading was due to the US VER rather than to the French VER.

Since the VER was apparently binding starting around 1984, we make an approximate calculation of consumer welfare loss during that year. Taking into account the effects of changes in quality the welfare loss is approximated by:

$$(2) \qquad \Delta w = (p_1 - p_0)\, S_1 + \frac{1}{2}\,(p_1 - p_0)\,(S_0 - S_1)$$

where $S_i = x_i\, Q_i$ is services defined in terms of quantity, Q_i times unit quality, x_i; p_i is unit service price; and subscripts 0 and 1 refer to 1984 values in the absence and in the presence of restricted services. With a demand elasticity of 2 (3), and assuming a VER-induced price rise of 9.6% the welfare loss is 320 (337) million FF and the number of cars restrained at 13,000 (20,000) units. Since the portion of the price increase attributed to quality upgrading was excluded from the welfare calculation, our estimates are lower than alternative ones which would attribute the entire price increase to the effect of the quota.

To calculate employment effects, assume that the overall demand elasticity for cars is unity so that the additional income spent on French or EC cars because of the VER in 1984 was approximately 330 (655) million FF. Making the further strong assumption that this additional expenditure fell entirely on French cars, we obtain an upper bound estimate of the increase in production

of about 5400 (10700) units in 1984 since the average French car price in that year was 61000 FF. Finally applying the labor coefficient of 0.06 men per car produced (Messerlin and Becuwe, 1987) gives the upper bound estimate of 324 (642) jobs saved in 1984. 12/

We mentioned in the introduction evidence of pricing to market (PTM) of German cars in the US market during the period of strong dollar appreciation. To check for the presence of PTM and to verify our claim that the VER was not binding in Germany, we compare the evolution of the (unweighted) average price of 11 common models sold in Switzerland, Germany and France during 1979-85 after deflating each price index by the local currency/yen index. In Switzerland there are no quantitative restrictions on Japanese car imports. Furthermore the Mark and Swiss Franc currencies moved closely together depreciating cumulatively by 48% and 36% respectively vis-a-vis the yen whereas the French Franc depreciated by 94%.

Table 6 shows the evolution of these indexes. Note first that the average yen price of these models is 17% higher in France and 14% higher in Germany in 1979 than in Switzerland. This is because the sales tax in Switzerland is lower than the VAT in Germany (15%) and in France (33%). Next, if one can assume that the elasticity of supply is infinite over the relevant range (a plausible first assumption in view of the small share in Japanese exports for these markets and the simultaneous VER in the US), 13/ then if there is no

PTM and the restriction is not binding, the three indexes should not depart too much from 1. The data show that the indexes for Germany and Switzerland move closely together and do not depart much from unity over the entire period. On the other hand, the index for Japanese cars sold in France has consistently a higher value and increases in value in 1985. Note that the index is also increasing in value for Germany but not for Switzerland, suggesting that the quota may have become binding in Germany starting in 1985. Since there were no restrictions on the Swiss market, we have here further evidence that the French restriction was binding, but no evidence of PTM.

5. Product Mix Comparisons Based on Multilateral Index Numbers

Now we shall use the same sample of cars of French, German, Italian and Japanese origins sold in France during the period 1979-85 and classify cars into k = 1, ..., 8 categories according to their fiscal horsepower. 14/ Within each supplying country, we now assume that cars can be treated as belonging to a number of distinct categories. Thus, within each supplying country, cars are now assumed to be perfect substitutes within each horsepower category, i.e. quality is a variable that is discreetly varied. Then, the relative demand for cars of different categories only depends on their relative prices and a VER will always lead to quality upgrading, i.e. there is a shift of imports towards the higher-priced category (Falvey, 1979). This is because the VER leads to a specific rise in prices which means a smaller percentage rise for the higher quality cars. With an ad-valorem tariff there would be no change in quality since the relative price of imports is not affected.

Relying on the theory of index numbers developed by Caves, Christensen and Diewert (1982), and following Aw and Roberts (1987), we construct multilateral price indexes that allow us to compare price and product mix indexes between different supplying countries and across time under the assumption that product mix change is reflected by a change in fiscal horsepower. 15/ Assume that the price per unit of service of bundle i is equal to the average price per unit of quantity, p^i, divided by the level of quality, A^i. The representative consumer's utility is represented by a translog utility function. He faces fixed prices and minimizes the expenditure on car purchases (assumed separable from other elements in his utility function) subject to a fixed level of utility. Then it can be shown that the relationship between any two bundles i and j where i and j may refer to a country, c, or a time period, t, can be written as:

$$(3) \qquad \ln p^i - \ln p^j = \ln A^i - \ln A^j + \ln p^*_{ij}$$

where

$$(4) \qquad p^i = \frac{\sum_k V_{kc}}{\sum_k Q_{kc}}$$

is the unit value of bundle i, in country c in time period t, k = 1, ... 8 has been defined above, c = 1, ...4, is the country index; Q and V are quantities and values; A^i is the product mix index, here measuring a change from one fiscal horsepower category to another; and

$\ln p^*_{ij}$ is the product-mix-adjusted Tornqvist multilateral price index defined by:

$$(5) \qquad \ln p^*_{ij} = \frac{1}{2} \sum_k (s^i_k + \bar{s}_k)(\ln p^i_k - \overline{\ln p_k}) - \frac{1}{2} \sum_k (s^j_k + \bar{s}_k)(\ln p^j_k - \overline{\ln p_k})$$

where $\bar{s}_k$ and $\overline{\ln p_k}$ are the cost shares and logarithmic prices for a hypothetical base observation, so that a comparison between two observations is the difference between the bilateral comparison between each observation and the base. The cost and prices for the hypothetical observation are given by:

$$(6) \qquad \bar{s}_k = \frac{1}{N} \sum_{i=1}^{N} s^i_k \quad ; \quad s^i_k = \frac{V_{kc}}{\sum_k Q_{kc}}$$

$$\overline{\ln p_k} = \frac{1}{N} \left(\sum_{i=1}^{N} \ln p^i_k \right)$$

where N is an index over countries and time for a given commodity kg. As shown by Caves, Christensen and Diewert (1982) the resulting indexes are superlative i.e., have the property of transitivity which bilateral indexes lack, and allow to make comparisons across supplying countries.

The unit values for each country appearing in the left-hand country column in table 7 capture both differences in car prices as well as differences in product mix across time and country observations. If the mix of products supplied by each source remains stable over time but varies substantially across countries, then cross-country comparisons using unit-value indexes will be distorted. If the importance of supplying countries varies over time, there will be a further distortion in unit values comparisons that treat all commodities from all countries as homogenous.

The translog multilateral price indexes correct for cross-section and time-series differences in the mix of cars supplied. They show that Italy and Japan remain the low cost suppliers but that Germany's price which was 18% above Japan's price in 1979 is only 7% above Japan's in 1985. On the other hand, France's price which was 6% above Japan's price in 1979 is still 5% above Japan's price in 1985. The translog price indexes for Italy, Germany and France grow significantly faster than the corresponding unit values due to a compositional shift towards cars with lower horsepower. On the contrary, there is no significant difference in the growth rates of the unit value and translog price indexes for Japan.

Next, consider the evolution of the product mix indexes. They measure the average flow of services per unit of sale for each bundle relative to Japan in 1979. These indexes show a move towards a similar product mix for Japanese, German and French cars. Indeed, the three product mix indexes are very close to one another by 1985. This could be interpreted as increased competition among the three countries as they offer a more similar product mix. In 1979 the

situation was quite different since Japanese cars were competing with Italian cars and to a lesser extent with French cars. On the other hand, Italian cars shift progressively towards a lower horsepower mix. Of course, Italian cars may have displaced competition in the lower horsepower range precisely because of their higher quality products in the lower horsepower range.

Finally, consider the pattern of product mix change for Japanese cars. In Section 4, we found evidence that the French quota on Japanese cars became binding in 1984 and 1985. We would therefore expect quality upgrading during those years. If one now interprets the product mix index as a quality index, this is confirmed by the figures in Table 7 which indicate a mild shift towards a higher horsepower mix in 1985. Since an important fall in horsepower mix occurred in the other three countries, we would have further evidence of a relative increase in quality by Japanese carmakers. 16/

6. Conclusions

This paper has analyzed implications of the UK, French and German VERs negotiated with Japanese carmakers. Comparisons of import shares with countries that did not enter into VERs with Japan suggest that Japanese market shares would have been higher in the absence of the VERs in the UK but not in Germany until 1985. Inspection of aggregate unit values also indicate that the domestic share in apparent consumption was declining in all three countries during the years immediately before the VER and that the decline continued after the VER entered into effect. Thus market share was captured by countries not affected by the VER.

Further analysis is provided by hedonic regressions for a sample of French, Italian, German, and Japanese cars sold in France during 1979-85. Observed prices of Japanese cars sold in France exceed prices predicted by characteristics during 1984 and 1985 but not in earlier years when price increases reflected quality upgrading. On the other hand, in Germany, observed Japanese prices do not exceed predicted prices during the entire sample period. As a further check, price comparisons were extended for a subset of Japanese models sold to Switzerland, a country with no quantitative restraint on Japanese autos. As expected, the average price of the same models sold in Germany and Switzerland followed a similar trend, while the average price of these same models was higher in France after netting out the effect of currency realignments.

Multilateral price indexes for cars sold on the French market indicate a significant change in product mix offered by different suppliers. Defining changes in product mix in terms of shifts between fiscal horsepower categories, the multilateral indexes indicate that by 1985 France, Germany, and Japan were offering similar product mixes, while Italy was offering a product mix that had shifted towards lower horsepower categories. Thus, insofar as offering similar product mixes is an indication of competition, it would appear that competition has intensified between France, Germany, and Japan.

Footnotes

1/ All producers conclude exclusive agreements with dealers as they refuse to sell to customers other than their official dealers who in return do not trade cars from more than one producer without the producer's agreement. Using cross-section data for 1983, Mertens and Ginsburg (1985) give evidence that car producers have been able to segment the European market into submarkets by showing that "equal quality" car price indexes vary greatly across EC countries (Belgium = 100, France = 117, Germany = 123, Italy = 132, U.K. = 144).

2/ Krugman (1985) gives evidence based on unit export values suggesting that PTM by German firms in the US during the dollar appreciation was particularly strong for the machinery and transport equipment sectors. Since the yen appreciated against European currencies when the VER was in effect, one cannot rule out the possibility that this appreciation was not reflected in higher prices on EC markets.

3/ The current U.S. VER on steel imports is somewhat porous since (small) amounts of finished steel products are currently imported from a number of countries with no steel mills. See Crandall (1987). Investing in the EC countries is not a bypass for the auto VER since Japanese producers would have to use 80% domestic content to receive EC treatment. However, some Japanese firms (e.g. Honda-Rover 200) are currently producing their own models under British brand names.

4/ The standard estimation approach assumes an otherwise homogenous good that is only differentiated by country of origin (the Armington assumption). This makes little sense in the case of cars where products should be grouped according to their characteristics and not only according to their origin. Thus only a subset of products compete with one another. Levinsohn (1986) develops a methodology based on the Lancasterian approach to consumer demand to determine empirically the neighbors for each of 100 cars sold in the U.S. market. This approach allows him to successfully estimate own and cross-price elasticities of demand for his sample.

5/ This agreement, in date since 1952, was initiated by the Japanese who feared penetration by small Italian cars.

6/ Viewing the car industry in terms of a duopoly, Harris (1985) argues that a VER will benefit both the home and foreign car producers subject to the VER. Dixit (1987) and Laussel et al. (1988) analyze optimal trade policy for the US and EC auto industries under imperfect market structures. In general, our analysis does not suggest strong restraining effects of the VERs, nor a move towards more imperfect market structures as a result of the VERs.

7/ p^e is the domestic currency price of selling abroad. Since car producers can effectively segment the home market, they can sell the same product at different prices at home and abroad. Alternatively, cars can be considered as different from cars sold abroad. In that case, the 45° lines would be replaced by a family of convex (to the origin) curves.

8/ For example, for the U.S., Levinsohn's (1986) estimates based on a characteristics approach to consumer demand for cars indicate a price elasticity of demand for U.S. autos with respect to a 1% increase in the price of Japanese cars of .18 when substitution by consumers towards other foreign cars is accounted for. When this substitution is not allowed for, the estimated price elasticity of demand is .36.

9/ This approach was pioneered by Griliches (1971) and has been recently applied by Feenstra (1984, 1985) to study the impact of the US VER on Japanese cars.

10/ After sorting observations by horsepower, we subdivided the sample into eight subgroups and deflated each subgroup variables by its subgroup variance.

11/ The computed F-statistic for testing the stability of the characteristic coefficients of the hedonic regression for the Japanese cars sold in France is 0.009.

12/ These results are similar to Feenstra (1984). A more plausible calculation would assume a cross price elasticity of demand for French cars of 0.2 as suggested by the econometric work of Levinsohn (1986). In that case, the additional income spent on French cars would be 66 (131) million FF, and 65 (131) jobs would be saved.

13/ Since the specifications for sale in the US market were different from those on European markets, assuming that cars can be modified at no extra cost for sale on the European market is only a rough approximation.

14/ The categories are $CV < 5$; $CV = 5$; $CV = 6$; $CV = 7$;, $CV = 8$; $CV = 9$; $CV = 10$; $CV \geq 11$; where CV is fiscal horsepower. Fiscal horsepower is related to engine size and RPM. Within each category we construct a unit value index from the models in that category. Insofar as the individual categories do not represent homogenous cars, then a changing mix of cars within each class will appear only as a price change so that the resulting measure of product mix change will understate the extent of product mix change that occurred.

15/ Fiscal horsepower is a formula that involves a nonlinear relationship based on engine rotation speed. Since engine performance within each fiscal class improved over the period, this discrete quality measure is crude. However, a regression over 1979-85 of fiscal horsepower on the characteristics used in the hedonic regressions accounts for 73% (Italian cars), 92% (Japanese cars) and 95% (French and German cars) of the variance. This suggests that fiscal horsepower is also an adequate proxy for quality.

16/ These results must, however, be viewed cautiously because of the difficulty of matching sales price data with published car characteristics so that a relatively small number of models are included in each horsepower category. As a result, we only capture approximately half of sales volume in each horsepower category.

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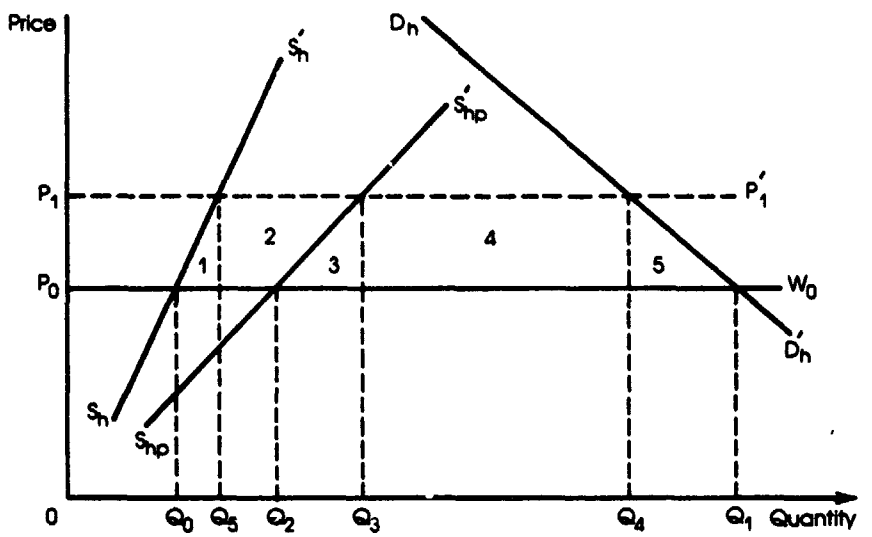
Figure 1
Trade Diversion Effects of a VER



$D_h D'_h$ = home demand curve

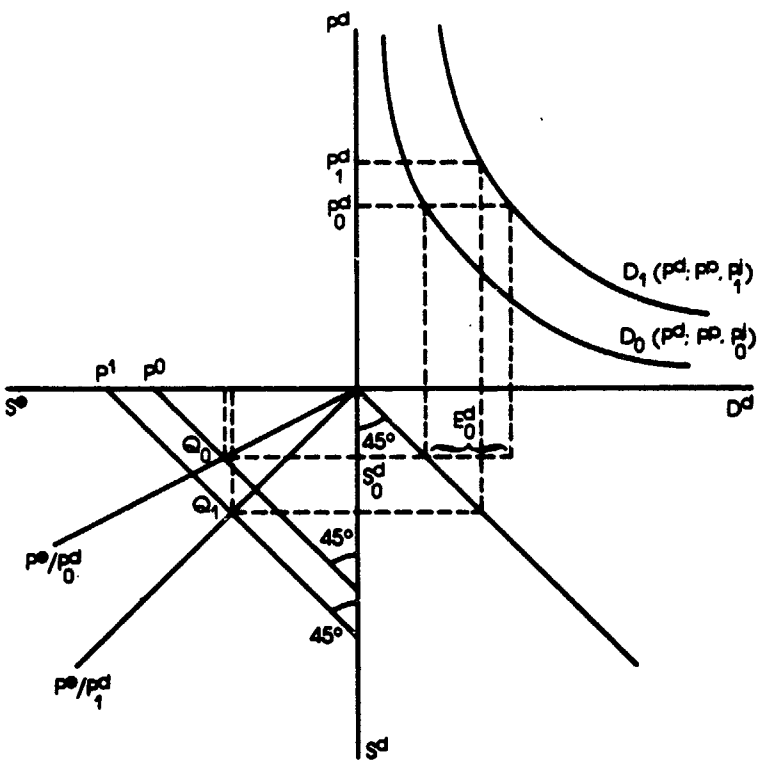
$S_h S'_h$ = home supply curve

$S_{hp} S'_{hp}$ = home + partner net export supply curve

$P_0 W_0$ = home supply curve

World Bank—41150:1

Figure 2
Equilibrium in the Domestic Car Market under a VER



World Bank—41150:2

Table 1:

Restrictions on Auto Trade

Types of Restrictions	U.S.A.	Japan	Benelux	Britain	France	Germany	Italy	Sweden
Basic tariffs	3%	0%	<----------		10.3%	---------->		
Special treatment	S. Korea: 0% (GSP) (until 1987)		Sweden:0% (EFTA); S. Korea: no tariffs on imports up to 4 million ecus in 1987 (GSP)					
Quantitative restrictions on imports	On Japanese cars: 1981-84:quota of 1.68 millions (a) 1984-85:quota of 1.85 millions (a) 1985-87:quota of 2.3 millions (a)						On Japanese cars: 1952-... bilateral quota of 2200 units	On Japanese cars: 1986-... surveillance on imports
Quantitative restrictions in terms of domestic consumption			1981-... VERs aiming at stabilizing Japanese imports at their 1980 levels	1977-... quota of 11% of domestic consumption for Japanese cars	1977-79-... quota of 3% of domestic consumption for Japanese cars	1981-... Japanese car consumption growth is limited to 1% per year of the German apparent consumption		

Table 1 (continued)

Restrictions on Auto Trade

Types of Restrictions	U.S.A.	Japan	Benelux	Britain	France	Germany	Italy	Sweden
Other restrictions		1981-07-...: Technical norms on a car-by-car basis				Technical norms		
Subsidies to domestic producers	Yes			Yes	Yes		Yes	

Sources: Feenstra (1984); Krijger and Mennes (1984).

Notes: (a) Special provisions involving less than 100,000 cars per year concern Japanese cars exports to Puerto Rico.

Table 2

Japanese Penetration in Some OECD Markets (1970-1986)

	Japanese Passenger Car Share in Apparent Consumption*								Share of Japanese exports	
Years	France	Germany+	United Kingdom	Belgium	Nether-lands	Sweden	Switzer-land	United States	to USA	to EC
1970	0.2	0.1	0.1	4.9	3.1	0.7	5.6	3.7	44.6	N.A
1972	0.4	0.4	3.0	10.0	9.5	2.8	13.7	5.7	41.9	N.A
1974	0.8	1.3	6.4	15.7	13.1	5.1	9.0	9.0	39.6	14.6
1975	1.5	1.7	9.0	16.5	15.5	6.5	8.4	9.4	39.0	17.5
1976	2.7	1.9	9.4	18.0	16.8	8.2	5.8	9.3	41.4	16.0
1977	2.6	2.5	10.6	19.3	19.8	10.4	12.1	12.4	45.3	16.3
1978	1.8	3.7	11.0	17.9	19.0	9.7	12.6	12.0	46.3	17.6
1979	2.2	5.6	10.8	18.0	19.5	10.0	16.0	16.6	49.9	19.7
1980	2.9	10.4	11.9	24.7	25.7	12.1	23.2	21.3	46.1	19.2
1981	2.6	10.0	11.0	25.0	24.4	13.7	27.2	21.8	44.6	17.2
1982	2.9	9.8 (11.0)	11.0	21.5	22.4	15.2	26.7	22.6	44.9	17.0
1983	2.7	10.6 (12.1)	10.7	22.5	23.5	15.2	27.4	20.9	44.6	20.0
1984	3.0	12.0 (13.3)	11.1	20.1	22.0	15.0	24.5	18.3	46.5	19.9
1985	3.1	13.3 (14.6)	10.9	19.8	22.3	16.1	25.5	20.1	50.1	17.9
1986	3.0	15.0 (16.1)	11.1	20.8	24.3	20.9	26.7	24.0	51.4	20.4

Sources: CSCA Chambre Syndicale des Constructeurs Automobiles.
JAMA Japanese Automobile Manufacturers Association.
MVMA Motor Vehicle Manufacturer Association.
Various issues.

Notes:

* Japanese new car registrations divided by total new car registrations.

\+ Figures in parentheses indicate market share (S_t) negotiated under the VER. The formula is $S_t = S_{81}\ (1.1)^t$, t = 1..., 4.

Table 3

Years	Total Car Registrations (in millions of units)			Domestic Market Share a/ %			Growth Rate of Production (%)			Total Exports in % of Production		
	France	Germany	United Kingdom	France	Germany	United Kingdom	France	Germany	United Kingdom	France	Germany	United Kingdom
1974	1.52	1.69	1.27	305.9	186.8	238.6	--	--	--	52.5	60.1	36.8
1975	1.48	2.10	1.19	271.2	178.7	188.8	-5.7	2.4	-17.4	53.5	50.8	40.7
1976	1.85	2.31	1.28	207.7	170.8	146.4	17.0	22.0	5.2	60.5	51.8	37.2
1977	1.90	2.56	1.32	231.9	166.9	95.3	3.0	6.9	-0.4	52.4	51.2	35.8
1978	1.94	2.66	1.59	244.8	149.2	98.8	0.6	2.6	-7.9	50.8	49.0	38.1
1979	1.97	2.62	1.71	227.0	148.5	61.8	3.5	1.1	-12.5	52.7	50.8	38.3
1980	1.87	2.42	1.51	177.5	136.3	75.4	-8.8	-10.5	-13.7	52.1	53.2	37.8
1981	1.83	2.33	1.48	133.3	146.0	84.4	-11.1	1.6	3.3	53.4	54.5	31.9
1982	2.05	2.15	1.55	107.4	157.4	66.5	6.3	5.1	-7.0	52.7	58.3	25.4
1983	2.01	2.42	1.79	106.3	128.3	66.5	6.6	3.1	17.7	54.5	56.4	22.7
1984	1.75	2.39	1.74	95.3	115.9	71.5	-8.4	-2.3	-13.0	56.4	58.9	21.1
1985	1.78	2.57	1.83	80.5	137.9	71.0	-3.0	9.9	15.3	58.5	61.6	19.8

Notes:

a/ Domestic market share is defined as (total car registrations - imports) ÷ imports.

Table 4

Hedonic Regressions by Supplying Countries (1979-1985)
Dependant Variable: List Prices in Constant (1979) Francs (Logarithms) or in Constant (1979) Marks (Logarithms)

Variables	French market				German market
	French Cars	German Cars	Italian Cars	Japanese Cars	Japanese Cars
Observations	268	200	101	128	100
R2	0.99	0.99	1.00	0.99	1.00
SSR	160.9	108.5	49.3	82.2	84.4
Intercept	8.285 *	9.212 *	8.245 *	9.575 *	12.665 *
	0.191	0.284	0.284	0.305	0.404
HorsePower	0.755 *	0.861 *	0.836 *	0.665 *	0.678 *
	0.040	0.059	0.068	0.071	0.095
Weight	0.006	0.035 *	0.010	0.052 *	0.032 *
	0.008	0.012	0.014	0.009	0.013
Width	0.974 *	0.243	0.892 *	-0.088	0.322
	0.149	0.208	0.229	0.215	0.290
D-1980	0.012	-0.088 *	0.024	-0.021	-0.027
	0.020	0.030	0.029	0.025	0.029
D-1981	-0.023	-0.139 *	-0.057	-0.002	0.005
	0.020	0.030	0.030	0.025	0.031
D-1982	-0.029	-0.058	-0.016	-0.001	0.008
	0.020	0.030	0.030	0.026	0.030
D-1983	-0.021	-0.064 *	-0.030	0.015	-0.004
	0.021	0.030	0.029	0.030	0.035
D-1984	0.001	-0.051	-0.005	0.096 *	0.001
	0.021	0.030	0.032	0.035	0.039
D-1985	-0.007	-0.050	0.091	0.072 *	0.016
	0.021	0.030	0.032	0.033	0.040

* denotes significance at the 5% level.

Sources: Auto Journal; Automobile Magazine; MVMA, various issues.

Table 5

Quality Adjusted Prices for Sample of Japanese Car Imports in France

	1979	1980	1981	1982	1983	1984	1985
Unit Value (FF)	29744	36607	41527	46143	54319	61722	62176
(% change) *		20.8	12.6	10.5	16.3	12.8	0.7
No of Models	15	17	18	17	15	16	17
No of New Models		3	0	0	0	2	4
Unit Quality (FF)	29988	36977	41347	46022	53355	55486	56355
(% change) *		20.9	11.2	10.7	14.8	3.9	1.6
Japanese cars imported (units)	48791	62339	51083	68572	55371	55208	58740

* calculated as the difference in logarithms

Table 6

Price Indexes of Japanese Cars in France, Germany and Switzerland (1979=1.0) a/

Year	France	Germany	Switzerland
1979	1.0 (1.0)	1.0 (.97) b/	1.0 (.83) b/
1980	1.17	1.10	1.06
1981	1.05	0.95	.96
1982	1.11	1.05	1.10
1983	1.07	.93	1.01
1984	1.05	.94	.97
1985	1.09	.97	.96

Sources: See text.

a/ Unweighted average of 11 model list prices (inclusive of all taxes) expressed in local currency deflated by the local currency exchange rate with respect to the yen.

b/ Expressed in yen vis-a-vis French price expressed in yen.

Table 7

Unit Values Price and Quality Indexes
(Relative to Japan = 1.0 in 1979)

	France			Germany			Italy			Japan		
		Tornqvist			Tornqvist			Tornqvist			Tornqvist	
Year	Unit Value	Price Index	Quality Index	Unit Value	Price Index	Quality Index	Unit Value	Price Index	Quality Index	Unit Value	Price Index	Quality Index
1979	1.15	1.06	1.08	1.41	1.18	1.20	1.02	1.00	1.01	1.00	1.00	1.00
1980	1.34	1.23	1.09	1.53	1.33	1.15	1.16	1.18	0.99	1.23	1.19	1.04
1981	1.38	1.39	0.99	1.68	1.40	1.20	1.12	1.20	0.93	1.40	1.35	1.03
1982	1.52	1.55	0.99	1.96	1.77	1.11	1.31	1.42	0.92	1.54	1.61	0.96
1983	1.82	1.79	1.02	2.12	1.97	1.08	1.50	1.63	0.92	1.83	1.88	0.97
1984	2.06	2.00	1.03	2.21	2.05	1.08	1.61	1.82	0.88	2.07	2.16	0.96
1985	2.11	2.18	0.97	2.30	2.22	1.03	1.71	2.07	0.83	2.04	2.08	0.98
Average Annual Growth Rate	0.10	0.12	-0.02	0.00	0.11	-0.03	0.09	0.12	-0.03	0.12	0.12	-0.00

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